

Amendments to the Drawings:

The attached sheets of drawings include changes to Figures 1A, 1B, 2 and 3. These sheets, which include Figures 1A, 1B and 2 - 5, replace the original sheets including Figures 1A, 1B and 2 - 5.

Attachment: Replacement Sheets

REMARKS

This is a Response to the Office Action mailed June 1, 2006, in which a three (3) month Shortened Statutory Period for Response has been set, due to expire September 1, 2006. A fee for a one (1) month extension is due by way of this amendment.

Twenty-four (24) claims, including four (4) independent claims, were paid for in the application. Claims 1, 3-5, 9-11, and 30-39 are pending, and claims 1, 3-5, and 9-11 are currently amended. New claims 30-39 have been added. No new matter has been added to the application. No fee for additional claims is due by way of this Amendment. The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

1. Drawings

Figures 1A, 1B, 2 and 3 have been amended, and three (3) replacement sheets of formal drawings are presented herewith for approval. Figures 1A and 1B have been amended to include the reference numeral "13" and to change a reference numeral from "16" to "16a". Figure 2 has been amended to include the reference numeral "14." Figure 3 has been amended to include the reference numeral "110" and to switch the locations of reference numeral "102" and "104." It is believed that no new matter has been introduced by way of these amendments.

2. Rejections Under 35 U.S.C. § 112

a. Rejections Under 35 U.S.C. § 112, first paragraph

In the Office Action, at section 2, page 2, claims 11, 24, and 28 stand rejected under 35 U.S.C. § 112, first paragraph. It is alleged that the claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Claim 11 has been amended to recite that "said layer of light-colored ink obscures

said layer of dark-colored ink,” and claims 24 and 28 have been cancelled. Applicants respectfully submit that one of ordinary skill in the art would know who to use light-colored ink to obscure a dark-colored ink, and the U.S.P.T.O. has acknowledged that it is NOT impossible to use a white color to obscure a dark color. (See section 3, page 2, of the Office Action.) Therefore, Applicants respectfully request that the rejection of claim 11 under 35 U.S.C. § 112, first paragraph, be withdrawn.

b. Rejections Under 35 U.S.C. § 112, second paragraph

In the Office Action, at section 4, pages 2 and 3, claims 1, 4, 6, 11, 24, and 28 stand rejected under 35 U.S.C. § 112, second paragraph. It is alleged that the claims are indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as the invention.

Specifically, claim 1, which included the phrase “said carrier becomes one of translucent or transparent when coated with a resin material,” was rejected because claim 1 was allegedly unclear as to if a resin coating was present. Amended claim 1 does not include the aforementioned phrase. Therefore, Applicants respectfully request that the rejection of claim 1 under 35 U.S.C. § 112, second paragraph, be withdrawn.

Claims 4 and 6 stand rejected because the phrase “the label” lacked antecedent basis. The phrase “the label” has been deleted from claim 4, and claim 6 has been cancelled. Therefore, Applicants respectfully request that the rejection of claim 4 under 35 U.S.C. § 112, second paragraph, be withdrawn.

Claims 11, 24 and 28 stand rejected because it is alleged that it is not clear as to the degree of opacity that is sufficient to obscure the dark color. Claim 24 and 28 have been cancelled, and claim 11 has been amended to recite that “said layer of light-colored ink obscures said layer of dark-colored ink.” Applicants respectfully submit that amended claim 11 points out with particularity and distinctly claims the subject matter regard as the invention. Therefore, Applicants respectfully request that the rejection of claim 11 under 35 U.S.C. § 112, second paragraph, be withdrawn.

3. Rejections Under 35 U.S.C. § 102

Claim 1 stands rejected under 35 U.S.C. §102(b) as allegedly anticipated by *Hill* (U.S. Patent 6,210,776), hereinafter *Hill* (see section 6, page 3) and as allegedly anticipated by *Howland* (U.S. Patent 6,089,614) (see section 7, page 4). For a proper rejection of a claim under 35 U.S.C. § 102, the cited reference must disclose all elements/features/steps of the claim. See, e.g., *E.I. du Pont de Nemours & Co. v. Phillips Petroleum Co.*, 849 F.2d 1430, 7 USPQ2d 1129 (Fed. Cir. 1988).

Applicants respectfully submit that independent claim 1, as amended, is allowable for at least the reason that neither *Hill* nor *Howland* discloses, teaches, or suggests at least the feature of “a mesh carrier with printed two layer ink indicia from a thermal printer, said two layer ink indicia comprising a bar code,” as recited in claim 1. In addition, the mesh carrier is included in a medium for adhering to a surface of a composite material.

Hill discloses printing on a substrate such as the substrates for retro-reflective materials that are commonly used in “road signs, safety clothing, reflectors on bicycles and motor vehicles, advertisements and the like.” (See column 15, lines 17 – 19.) There is no apparent indication that *Hill* discloses a mesh substrate as claimed, and in addition, there is no apparent indication that *Hill* discloses printing a bar code on the mesh carrier. Thus, *Hill* does not anticipate claim 1, and Applicants respectfully request that the rejection claim 1 be withdrawn.

Howland discloses printing on a substrate such as a “document of value such as a banknote.” (See column 6, lines 33 and 34.) There is no apparent indication that *Howland* discloses a mesh substrate having indicia of a bar code. In addition, claim 1 recites “a mesh carrier with printed two layer ink indicia from a thermal printer.” *Howland* does not apparently disclose a “two layer ink indicia from a thermal printer.” Thus, *Howland* does not anticipate claim 1, and Applicants respectfully request that the rejection claim 1 be withdrawn.

4. Rejections Under 35 U.S.C. § 103(a)

Claims 1 and 5 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over *Nakao et al.* (U.S. Patent 5,683,784) hereinafter *Nakao*. The Office Action states that *Nakao* “does not teach indicia per se, but does teach the record printing via ink jets for advertising signs (5:20-25).” (See the Office Action at section 9, page 5.) It is well-established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest, either implicitly or explicitly, all elements/features/steps of the claim at issue. See, e.g., *In Re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988), and *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

a. Claim 1

Applicants respectfully submit that claim 1, as amended, is allowable for at least the reason that the *Nakao* does not disclose, teach, or suggest at least the feature of “two layer ink indicia,” as recited in claim 1, nor does *Nakao* disclose, teach, or suggest at least the feature of the “two layer ink indicia comprising a barcode,” as recited in claim 1. Lastly, claim 1 recites the “two layer ink indicia comprised of a layer of light-colored ink and a layer of dark-colored ink, wherein the layer of light-colored ink and the layer of dark-colored ink overlap.” Applicants respectfully submit that *Nakao* fails to disclose all of the aforementioned features. Therefore, a *prima facie* case establishing an obviousness rejection by *Nakao* has not been made. Thus, claim 1 is not obvious, and Applicants respectfully request that the rejection of claim 1 be withdrawn.

b. Claims 3 – 5 and 8 – 11

Claims 3-5 and 8-11 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over *Nakao* in view of *Nitta* (U.S. Patent 5,494,735), hereinafter *Nitta*. The Office Action relies upon *Nitta* for disclosing a thread count and relies upon *Nakao* for disclosing the other limitations of claims 3-5 and 8-11.

With regard to claim 3, claim 3 includes the limitation of “the mesh carrier is a porous woven mesh having a thread count between 180 and 560 threads per inch.” The Office

Action cites *Nitta*, column 3, lines 1 – 33 and column 4, lines 1 – 25, for disclosing the claimed limitation. (See Office Action, section 9, page 5.) Applicants respectfully submit that *Nitta* discloses a fabric “woven of warp threads of 40 to 150 *denier* at 50 to 140 ends per inch and waft threads of 40 to 150 *denier* at 50 to 140 picks per inch.” (See column 3, lines 13 – 15.) Applicants respectfully submit the word “*denier*” is defined as: a unit of weight indicating the fineness of fiber filaments and yarns. (See The Random House Dictionary of English Language, Second Edition, Unabridged, Random House, Inc.) Thus, *Nitta* discloses 50 to 140 “warp” threads per inch and 50 to 140 “weft” threads per inch, both of which are outside of Applicants’ claimed range. Thus, Applicants respectfully submit that the combination of *Nakoa* and *Nitta* do not disclose, teach, or suggest, the limitations of claim 3.

With regards to dependent claims 3-5 and 8-11, all of which depended directly or indirectly from independent claim 1, Applicants respectfully submit that the dependent claims 3-5 and 8-11 are allowable for at least the reason that the claims depend from independent claim 1 and that independent claim 1 includes limitations that are not disclosed, taught, or suggested by the combination of *Nakoa* and *Nitta*. See, e.g., *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). Accordingly, the rejection to these claims should be withdrawn.

5. New Claims 30 - 39

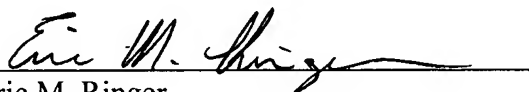
New claims 30-39 are based on subject matter that is explicit and/or inherent within the description of the specification and/or the drawings. Applicants submit that no new matter has been added in the new claims 30-39 and that new claims 30-39 are allowable over the cited prior art. Therefore, Applicants request the Examiner to enter and allow the above new claims.

6. Conclusion

In light of the above amendments and remarks, Applicants respectfully submit that all objections and/or rejections have been traversed, rendered moot, and/or accommodated, and that all pending claims 1, 3-5, 9-11, and 30-39 are allowable. Applicants, therefore, respectfully request that the Examiner reconsider this application and timely allow all pending

claims. The Examiner is encouraged to contact Mr. Ringer by telephone to discuss the above and any other distinctions between the claims and the applied references, if desired. If the Examiner notes any informalities in the claims, he is further encouraged to contact Mr. Ringer by telephone to expediently correct such informalities.

Respectfully submitted,
SEED Intellectual Property Law Group PLLC


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Enclosures:

Redlined Substitute Specification Showing Changes
Substitute Specification
3 Sheets of Replacement Drawings (Figs. 1A, 1B, and 3 - 5)

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DUAL CONTRAST EMBEDDED MESH FOR IDENTIFICATION OF VARIOUS COMPOSITE MATERIALS

Field of the Invention

This invention relates to embedded labels and barcodebar codes.

- 5 Specifically, this invention relates to embedded labels and barcodebar codes for composite materials that can be used with both dark-colored and light-colored composites.

Description of the Related Art

- Direct marking of composite materials or parts such as Kevlar, fiberglass, carbon fiber, etc. with a data carrier is difficult for several reasons. First, the data carrier, which carries a marker or indicia, must be very thin and porous to avoid affecting the functionality of the part to be marked. Second, the data carrier must be relatively simple to use. Third, in many applications the marker and/or indicia must be visible against the substrate-composite material so
- 10 that the coding or indicia can be read. Separate labels are used to mark dark- and light-colored composites. It is desirable to have a data carrier that can be used with both light and dark-colored composite materials. This invention eliminates the problems that existing data carriers have with these issues.

- One prior art method of marking composite materials is to embed printed fabric into light-colored composite materials as a means-way of marking them for identification purposes. This process involves the encapsulation of a white typewriter-printed fabric within a heat-curable resin on the surface of the item composite material being marked. It does not provide a means of marking dark-colored composite materials. The-A data carrier with dark-colored ink does not
- 20 provide sufficient contrast on dark surfaces. Similarly, prior art ribbons with excellent contrast on dark surfaces, using lighter colored pigments or reverse

printing on a light-colored mesh, do not provide enough contrast when adhered to lighter colored surfaces.

5 The A composite part is coated with thermally curable liquid resin that will be baked at a high temperature to reinforce and protect the composite part. Before the resin is cured, the a data carrier is placed onto the liquid resin, adhering the data carrier to the composite material or part. A second coating of liquid resin is applied over the data carrier. The resin is then cured. There is a need for a means of marking composite materials for identification that will not affect the functionality of the part composite material. Accordingly, it is another
10 object of the present invention to provide a means for marking composite material that does not affect the functionality of the part and which is simple to use.

There is a need for a single product that can be embedded into a composite part made of either light-colored or dark-colored composite and still provide enough contrast to decode the barcodebar code.

15 SUMMARY OF THE INVENTION

 The A composite components are is created by laminating flexible layers of Kevlar, fiberglass, carbon-fiber, etc. with a liquid resin. When the resin cures, the part composite component becomes a hardened stable component. The A printed mesh is pressed into the resin before curing or may be applied to a
20 part of the composite component in a separate later step. Once the resin hardens, the printed mesh becomes a permanent part of the composite component. When the printed mesh is permeated with the liquid resin, it the printed mesh becomes translucent. Any identifying marks on the printed mesh are visible on the surface of the finished product composite component.

25 The printed indicia must provide sufficient contrast with the base item. This has been a challenge if use of a single media is desired for embedding in both light and dark surfaces.

An object of this invention is a single product mesh carrier that can be embedded into a composite part component, which can be made of either light-colored (for example, yellow Kevlar) or dark-colored (for example, carbon composite) composite materials, and that the mesh carrier will still provide enough contrast to ~~decode~~ view or read a ~~barcode~~ bar code or other indicia on the carrier mesh for both light-colored or dark-colored composite materials.

The ~~inventive carrier is a~~ A two-layered print ribbon--one ink layer being light-colored and the other ink layer being dark-colored. ~~The ribbon is~~ used to print a two-layer symbol, ~~barcode~~ bar code, image or indicia on a mesh carrier. The mesh carrier becomes translucent when permeated by liquid resin, exposing the ~~desired ink layer~~. The imaged mesh carrier becomes an integral element of the a finished composite component.

~~When marking light colored substrates with the inventive media construction, the mesh is positioned such that the mesh side contacts the composite and the printed image faces towards the scanner. When marking dark-colored substrates, the media is positioned with the printed image facing the composite and the mesh side up, so that the light colored ink is facing the scanner. This eliminates having two separate printing systems within the manufacturing area and ensures that a proper image is marked onto the substrates.~~

~~With this construction, the printed mesh can be placed onto the part being marked with either the light colored ink layer (for dark surfaces) or dark-colored ink layer (for light colored surfaces) facing the user. The mesh becomes translucent when permeated with the resin, thus by simply flipping the printed mesh over, the same construction can be used for both light colored and dark colored surfaces. This ensures that the scanner, regardless of what color the substrate is, can read every part marked with this construction. Furthermore, this construction eliminates the need for separate ribbons within the manufacturing environment for light colored substrates and for dark colored substrates.~~

BRIEF DESCRIPTION OF THE DRAWING(S)

Figure 1A is a schematic representation of an expanded cross section of a light composite material with an embedded mesh carrier carrying a barcode printed with two-layer ink.

- 5 Figure 1B is a schematic representation of an expanded cross section of a dark composite material with an embedded mesh carrier carrying a barcode printed with a two-layer ink.

Figure 2 is a schematic representation of a cross section of a mesh carrier carrying a barcode printed with a two-layer ink.

- 10 Figure 3 is a schematic representation of the a printer ribbon.

Figure 4 is a schematic representation of a dark-colored composite with a mesh carrier carrying a barcode printed with a two-layer ink.

Figure 5 is a schematic representation of a light-colored composite with a mesh carrier carrying a barcode printed with a two-layer ink.

- 15 Figure 6 is a printed bar code on the mesh carrier.

Figure 7 is a bar code on a light-colored composite.

Figure 8 is a bar code on a dark-colored composite.

DETAILED DESCRIPTION OF THE INVENTION

- Composite materials 10 are typically formed from at least one
20 reinforcing material and a matrix. The reinforcing material may be, for example, fiber, particulate, or a laminate. Matrix materials may be, for example, ceramic or polymers. Through the selection of variables such as reinforcing material(s), matrix material, composition and reinforcement arrangement composites with a wide range of properties have been developed. Common composite materials are
25 glass-polymer, graphite-polymer, Kevlar-epoxy, Kevlar-polyester and carbon-carbon composites. Polymer and ceramic matrix composites are widely used, for example, in automotive, marine, aircraft, and aerospace components. They are also used in sporting goods, such as tennis rackets, skis, and fishing rods.

~~Imaged~~ An imaged mesh or printed mesh that is adhered to a composite component becomes an integral element of the finished composite component. Composite components are created by laminating flexible layers of Kevlar, fiberglass, carbon-fiber, etc. with a liquid resin. When the resin cures, the part becomes layers become a hardened stable composite component. ~~The~~ An identifying mesh or data carrier or mesh carrier or printed mesh is pressed into the resin before curing. Once the resin hardens, the mesh becomes a permanent part of the component. Alternatively, the ~~data-mesh~~ carrier can be attached to the part composite component at a later step. Any identifying marks on the mesh carrier are then visible as a mark in the surface of the finished ~~product~~ composite component. Preferably, when the mesh carrier is permeated with the liquid resin, ~~it~~ the mesh carrier becomes translucent.

A label or medium 13 for marking a substrate of a composite material is comprised of a mesh carrier 12 having indicia 14 printed thereon. The indicia 14 includes a layer of dark-colored ink 102 and a layer of light-colored ink 104.

For applications with visible markers, the ~~marker-medium~~ 13 must provide sufficient contrast with the base item such that it-the visible markers can be read. The printed indicia must provide sufficient contrast with the base item. This has been a challenge if use of a single medium is desired for embedding in both light and dark surfaces.

When marking ~~light-colored substrates~~ a light-colored substrate 112 with the ~~inventive media~~ medium 13 construction, position the mesh carrier 12 is such that the printed image and dark ink layer 102 of the indicia 14 faces towards the-a scanner.

When marking dark-colored substrates 114, flip the ~~stencil-mesh~~ carrier 12 over so that the light-colored ink 104 of the indicia 14 is facing ~~the-a~~ scanner. The white or light-colored layer of ink 104 ~~would-will~~ be visible through the ~~porous-mesh~~ carrier 12 or a porous mesh carrier in the finished composite product and the white or light-colored layer of ink 104 ~~would-will~~ provide adequate

contrast with the dark substrate 114 to which it is attached. ~~This~~ Thus, the mesh carrier 12 having the indicia 14 print thereon, which includes the layer of dark-colored ink 102 and the layer of light-colored ink 104, eliminates the need for having two separate printing systems within the a manufacturing area and ensures
5 that a proper image is marked onto the substrates 10.

The printed mesh carrier can be placed onto the part being marked with either the light-colored ink layer (for dark surfaces) or dark-colored ink layer (for light-colored surfaces) facing a user. The mesh carrier becomes translucent when permeated with the resin. Thus, by simply flipping the printed mesh over,
10 the same medium 13 can be used for both light-colored and dark-colored surfaces. This ensures that a scanner, regardless of what color the substrate is, can read every part marked with the medium 13. Furthermore, there is no need for separate ribbons within the manufacturing environment for light-colored substrates and for dark-colored substrates.

15 In a first preferred embodiment a porous mesh carrier 12 is printed with a thermal ink, ~~that~~ The mesh carrier 12 is then adhered to a substrate for direct parts marking. The porous mesh carrier 12 preferably has a thread-count between 180 and 560 threads per inch. Preferably, the mesh carrier is polyester. Alternatively, ~~it~~ the mesh carrier could be made of nylon or other known material,
20 capable of being constructed into a porous mesh or other porous material such as paper.

A single thermal transfer ribbon 110 is used to print an image that such as indicia 14. The image provides enough contrast for the a scanner when the image is adhered to both dark-colored surfaces and light-colored surfaces.
25 This is done by using a ~~special~~ the ribbon 110, ~~that~~ which is coated with two separate layers of ink, one on top of the other with one layer of ink being the light-colored ink 102 and the other layer being the dark-colored ink 104.

The printer ribbon 110 comprises a the light-colored ink/primer layer 102, a dark-colored ink layer 104, a release primer layer (if needed) 106, and a

PET ribbon carrier 108. The ~~dark-colored~~ layer of dark-colored ink 102 is closest to the printhead. Thus, after the mesh carrier 12 is printed with an image using the ribbon 110, the printed mesh carrier ~~it~~ has a layered structure. First, there is a dark-colored ink layer 102, next a light-colored ink layer 104, and then the porous mesh 12.

When ~~embedding this construction into~~ adhering the medium 13 onto a light-colored substrate 112, e.g. yellow Kevlar, fiberglass, etc., the orientation of the ~~mesh-medium 13~~ would be dark-colored ink layer 102, light-colored ink layer 104, porous polyester-mesh carrier 12, and light-colored substrate 112. This orientation of the ~~mesh-medium 13~~ in relationship with the substrate would provides excellent contrast. The dark-colored ink 102 is viewed against the light-colored substrate 112.

For a dark-colored substrate 114, e.g. carbon fiber, etc., the carrier mesh 12 is the top layer, the light-colored ink 104 is next, then the dark-colored ink layer 102 is closest to the dark-colored substrate 114. The printed mesh carrier 12 becomes-is relatively transparent when permeated with resin 16, allowing the image printed with the light-colored ink 104 to show through the mesh carrier 120. The light-colored ink layer 104 has sufficient opacity as to obscure the presence of the dark-colored ink layer 102 and the substrate 114. The white or light-colored layer of ink 104 is visible through the porous mesh 12 in the finished composite product-component and the white or light-colored layer of ink 104 provides adequate contrast with the dark substrate 114 to which it is attached.

A second preferred embodiment uses a reflective ink layer such as a metallic ink is used for the dark-colored ink layer 102. The metallic ink layer has been shown to provide excellent contrast against dark-colored substrates. Magnetic ink character recognition (MICR), uses a reader that can discern characters printed onto non-magnetic materials using magnetic ink in much the same manner as optical character recognition (OCR) scanners use contrast between the black image and the white paper to discern the characters. MICR is

used to print the account numbers on the bottom of checks to make them easily scanned. Similar magnetic imaging technology will allow persons to scan machine-readable bar codes.

5 A third preferred embodiment uses a phosphorescent clear ink that would be visible when viewed under a black light. The scanner can be modified so that it scans at the same wavelength as the black light. In doing so, the security of the symbol could be maintained and the use of counterfeit items could be prevented.

10 The fourth preferred embodiment would involve pre-printing the porous ~~media~~medium using other printing technologies such as screen printing and hot stamp to create the mark. This is useful when one wants to embed static information onto the surfaces to be marked.

A fifth preferred embodiment uses ink jet technology to print dynamic information onto the porous ~~media~~medium using two passes. The first pass prints
15 the light-colored ink 104 followed by a second printing of dark-colored ink 102.

The mesh carrier works for embedding because it is thin and porous, allowing surrounding composite material to flow into the pores and bond with the mesh.

Referring to Figures 1A and 1B, composite material with an
20 embedded ~~barcode~~mesh carrier having a bar code printed thereon is shown. The composite material consists of a plurality of layers of a composite material 10. Indicia 14 is printed on one surface of the ~~data~~mesh carrier 12. Preferably, the ~~data carrier 12 is a mesh.~~ More preferably, the ~~data~~mesh carrier 12 is a porous woven mesh. Most preferably, the ~~data~~mesh carrier 12 is a porous woven mesh
25 that is very thin and porous. The porous woven mesh allows the matrix material of the composite material 10 to flow into the fabric, eg., the porous woven mesh, thus bonding the wet mesh with the composite material 10.

The mesh carrier 12 is printed with ~~the~~an appropriate indicia 14. The indicia 14 may be any suitable text, a symbol, bar code or other indication. In the preferred embodiment of the present invention, the indicia 14 is a bar code.

The printed mesh carrier 12 will be embedded in or on the surface 11 of the composite 10 using a heat-curable, resin material 16. The composite material 10 can be particulate, laminar, chopped fiber, unidirectional or other known composite type. The resin material 16 is preferably selected based on the composite material. The preferred resin material is a heat-curable resin. Preferably, the ~~data~~mesh carrier 12 with printed indicia 14 is placed on the composite 10 during the manufacturing process and the mesh carrier is coated with the heat curable resin 16. Alternatively, the mesh carrier 12 is placed on the composite 10 after the composite has been manufactured. The resin 16 is then coated over the mesh ~~10~~ carrier 12. The printed mesh carrier 12 may be embedded or adhered on the surface 11 of the ~~part~~ composite material 10 during manufacture of the ~~part of composite material or~~ at a later time such as during assembly of a product from the part using the composite material.

The ~~bar code~~ medium 13 comprises a ~~the~~ porous mesh carrier 12 printed with the indicia 114 using a ~~the~~ two-layer thermal transfer printer ribbon 110. The ribbon 110 as shown in Figure 3 is a light-colored ink layer 104 or primer layer, a dark-colored ink layer 102, a release primer layer 106, if necessary, and a PET carrier ribbon 108. The ribbon 110 is placed in ~~the~~ a printer with the dark-colored ink layer 104 closest to the print head and the light-colored ink layer closest to the mesh carrier 12 ~~100~~ substrate to the printed. The printed mesh carrier 12 shown in Figure 2 ~~thus has~~ the light-colored ink 104 next to the mesh carrier 12 and dark-colored ink 102 on top of the light-colored ink 104. Alternatively, using a different printer ribbon, the dark ink layer could be next to the mesh carrier and the light ink layer on top of the dark layer. The medium 13 having the layered indicia 14 printed on the mesh carrier 12 can be used to mark both light and dark-colored composites 112, 114.

Referring to Figures 1A, 5 and 7, on a light-colored composite 112, the printed mesh carrier 12 is placed mesh side down on the composite 112. The dark-colored ink 102 is visible. Referring to Figures 1B, 4 and 8, on a dark-colored composite 114, the printed mesh carrier is placed dark-colored ink 102 side down. When the mesh carrier 12 is coated with the resin material 16, the mesh carrier 12 becomes relatively transparent. This allows the image printed with light-colored ink 104 to show through the mesh carrier 12. The light-colored ink layer 104 has sufficient opacity so as to obscure the presence of the dark-colored ink layer 102 and the substrate. The ink-indicia 14 can be read with a bar code reader or scanner.

In an alternative embodiment, the dark-colored ink layer 102 is a metallic ink. Metallic ink has been shown to have good contrast against dark-colored substrates. Alternatively, a single metallic ink layer could be used with light and dark-colored substrates. When metallic ink is used it can be scanned using MICR or other similar technology.

The mesh carrier 12 is preferably made of polyester, but any porous mesh material such as nylon can be used. Preferably, the mesh has about 180 to 560 threads per inch.

In an alternative embodiment, the mesh carrier 12 could be printed by first printing indicia with a light-colored ink 104 and then reprint the indicia with a dark-colored ink 102. This embodiment is especially well suited to an ink jet printer. ~~Whereas,~~ However, the dual layer ink ribbon 110 is especially well suited for a thermal transfer printer.

Alternatively, the porous mesh carrier 12 could be pre-printed with indicia using other printing technologies such as screen printing and/or hot stamping to create the mark. This is useful when the information to be printed is static.



ABSTRACT

An integral label for composite materials. ~~The label,~~ printed with two layers of ink may be embedded on ~~the~~a surface of ~~the~~a composite material using a heat curable resin. The label that provides good contrast with both light or dark~~-~~colored composite materials. A light~~-~~colored ink layer being exposed when the label is used with a dark~~-~~colored composite and the label being reversed to expose a dark~~-~~colored ink layer when used with a light~~-~~colored composite.

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